RECEIVED
CENTRAL FAX CENTER
NOV 2 9 2006

Attorney Dkt: UCF-237

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: GLEBOV ET AL.
Serial No.: 10/665,339
Group No.: 1756
Utility Application Filed: 09/19/2003
Continuation-In-Part of Serial No.: 09/750,708 filed 12/28/2000 now Patent No. 6,673,497, which is a Continuation-In-Part of Serial No. 09/648,293 filed 8/24/00 now Patent No. 6,586,141 which claims the benefit of priority to Provisional Application SN 60/174,432 Filed 01/04/00
Examiner: Martin J. Angebranndt

For: SENSITIZATION OF PHOTO-THERMO-REFRACTIVE GLASS TO VISIBLE RADIATION BY TWO-STEP ILLUMINATION

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

LEONID B. GLEBOV declares that:

1. I am a co-inventor of and familiar with the present U.S. Patent Application 10/665,339 filed on 09/19/2003 which is a Continuation-In-Part of U.S. Patent Application 09/750,708 filed 12/28/00, now U.S. Patent 6,673,497 which is Continuation-In-Part of 09/648,293 filed 08/24/00, now U.S. Patent No. 6,586,141, which claims the benefit of priority to U.S. Provisional Application 60/60/174,432 filed 01/04/00 in the name of the University of Central Florida, which is entitled: Sensitization of Photo-Thermo-Refractive Glass to Visible Radiation by Two-Step Illumination. I am familiar with the Official Action dated August 31, 2006 and with the prior art references cited in the Official Action, including a first publication: Glebov et al. "Photo-Induced Processes In Photo-Thermo-Refractive Glasses", XVIII International Congress on Glass, San Francisco, California, USA, July 5-10, 1998, pages 63-68 which corresponds to the publication cited by the examiner in the office action entitled: Glebov et al. Proc. Int. Congr. Glass, 18th (1998) pp.1151-1156 (the First Publication). I am also familiar with the second reference publication cited in the same Official Action that the Examiner entitled: Bukharev et al., "Recording of holograms on radiation color centers in glass", Pis'ma v Zhurnal Tekhnicheskoi Fiziki Vol. 1(21) pp. 975-7 (1975) and U.S. Patent No. 4,125,404 issued to Araujo et al. and U.S. Patent Application No. US-2003/0015509 by Gaissinsky.

2. I received a Masters degree in Physics from Leningrad Polytechnic Institute of Leningrad, Russia, in 1971. I received a PhD in Physics, with a Major in Optics from The State Optical Institute, Leningrad, Russia in 1976. From 1976 to 1995, I was employed at the State Optical Institute, Leningrad, Russia, as a Research Scientist doing work in generation of radiation defects in glasses, Senior Research Scientist doing work in laser induced damage, integrated optics and hologram recording in glass, head of Laboratory of colorless optical glasses doing work in study and development of colorless optical glasses and waveguides, manager of

Optical Glass Division doing work in coordination of study and development of all optical glasses in USSR, Associate Director in Basic Research doing work in planning of basic research in optics, and Director, doing work in managing of research in optics. From September 8, 1995 to present date, I have been employed by the Center for Research and Education in Optics and Lasers (CREOL) at the University of Central Florida, in Orlando, Florida as a member of the faculty as a Research Professor. From September, 1999 to the present time, I have also been employed with Light Processing and Technologies, Inc., of Orlando, Florida as President.

My primary areas of research include (a) optical properties of glasses; (b) photosensitive glasses for hologram recording; (c) nonlinear phenomena including laser-induced damage; and (d) holographic elements.

I have been an inventor and co-inventor on approximately fifteen Russian Patents, on two United States Patents, and on several United States Patents applications, which include the parent application to this subject application (SN 09/750,709) which has now been allowed as U.S. Patent No. 6,673,497 and U.S. Patent No. 6,586,141. I have also authored and co-authored over 200 publications in the areas stated above.

3. The term Absolute Diffraction Efficiency describes the diffracted part of incident optical radiation. This parameter depends on both refractive index modulation and losses in photosensitive material.

A significant part of the invention is the discovery that Photo Thermal Refractive Glass (PTR glass) referenced in the claims has Absolute Diffraction Efficiency of greater than at least 96%. Specifically, page 7, line 4, page 20, line 12 and originally filed dependent claim 3 of the parent application (09/750,708) specifically refers to having "absolute diffraction efficiency" of at least "96%". These features and their combination with PTR glass being used as a "volume holographic optical element" are unique and are not anticipated nor rendered obvious from the First and Second Publications and U.S. Patent referenced above.

I have been studying PTR Glass for over 30 years because of my research interest in these areas. My involvement in photosensitive glass started back at least as early as 1972. I was a co-inventor of the term "Photo-thermo-refractive (PTR) glass" approximately in 1998 when we discovered in several glasses the phenomenon of variations of refractive index induced by UV exposure followed by thermal treatment.

It was NOT until AFTER October 1998 (the date of the publications referenced in the office action) did my co-authors and I discover that we can actually record phase holograms by first exposing the PTR glass to a UV source and exposing the UV exposed glass to visible light for holograms generated by refractive index modulation after thermal treatment. .

More than one year before the September 19, 2003 filing of the subject application, there was NO PUBLIC DISCLOSURE of the novel features of the Subject invention.

With the subject inventions I was surprised by at least eight observations:

(1) Decreased concentrations of impurities of iron and heavy metals results in decreasing of refractive index in UV exposed areas after thermal development with minimum coloration;

(2) The sensitivity of exposed PTR glass to the secondary illumination by visible radiation is higher compared with UV photosensitivity of Ge-doped silica;

(3) The exposure of the UV exposed PTR glass blank to visible light results in partial nonlinear transformation of nucleation centers;

(4) Ability to record high-efficiency phase holographic elements which can serve as compact robust optical components are implemented by the two-step illumination of PTR glass according to the subject invention;
(5) Dependence of the value of induced refractive index on dosage of the primary UV illumination and power density of the second illumination proves that recorded effect results from a nonlinear process;
(6) Phenomenon provides opportunity to record diffractive optical elements based on modulation of refraction index and refractive optical elements based on increment of refractive index; and
(7) This phenomenon enables fabrication of high-efficiency holograms by visible radiation produced by commercial lasers.

4. The goal of the invention is to shift a spectrum of photosensitivity of PTR glass to a longer wavelength region, which paves a way to technology of complex nonplanar hologram recording and to convert the refractive index decrement to an increment, which paves the way to broadening the useful technology of refractive optical elements recording.

5. I am familiar with the first publication: Glebov et al. Photo-Induced Processes In Photo-Thermo-Refractive Glasses, XVIII International Congress on Glass, San Francisco, California, USA, July 5-10, 1998, pages 63-68 which corresponds to the publication cited by the examiner in the office action entitled: Glebov et al. Proc. Int. Congr. Glass, 18th (1998) pp.1151-1156 (herein after referred to as the First Publication).

This publication paper that was first publicly presented in July 1998 discussed features of PTR glasses for use as 3D holograms. It should be noted that this paper most clearly references "Relative Diffraction Efficiency" on the second page.

There was no mention in the 18th International Congress on Glass paper for recording phase holograms by refractive index modulation using a two-step exposure process to record the phase hologram and wherein the recorded effect results from a nonlinear process.

Subject independent claims 1, 13, 15 and 23 now claim methods and apparatus for recording phase holograms with a nonlinear two-step exposure process that are generated refractive index modulation. Clearly, the subject invention tested different PTR glass that exceeded the tested 93% threshold of the 1998 public disclosed PTR glasses and at substantially different grating spatial frequencies. The tested absolute diffraction efficiency achieved and the volume holographic optical elements described in this 1998 public disclosure are outside the scope of the subject claims.

Thus, the novel combination of exposure of PTR glass having a reduced concentration of iron and heavy metal to UV light followed by exposure to visible light and thermal treating the UV and visible light exposed PTR glass to generate a phase hologram by refractive index modulation is outside the scope of the 18th International Congress on Glass paper and the view graphs made public in July 1998.

6. I am familiar with the Araujo patent: Araujo's patent describes a photochromic glass which changes its absorption coefficient under exposure to visible and UV radiation. This glass can be used for amplitude hologram recording with diffraction efficiency not exceeding 4% and cannot be used for holographic optical elements.

7. I am familiar with the Bukharaev publication: Bukharaev's publication describes amplitude hologram recording by bleaching of color centers in glass. This hologram results from modulation of absorption coefficient of glass but not modulation of refractive index as in the subject invention. Such amplitude holograms have theoretical limit of diffraction efficiency at 4% and therefore cannot be used for high efficiency holographic elements fabrication which is discussed in the subject application.

8. I am also familiar with the Gaissinsky patent which is directed to producing laser-induced breakdown in the bulk of a photosensitive glass. Breakdown results in hot plasma generation in focal spot. Further thermal development results in coloration of UV exposed volume in accordance with old Corning patents. The Gaissinsky patent has nothing common with phase (refractive index modulation) hologram recording by external source of UV or visible radiation described and claimed in the subject application.

9. I am also familiar with the publication referred to in the office action entitled: IBM Tech. Discl. Bull., Vol 31(3), pp. 18-21(08/1988).

This paper does not mention PTR glass having absolute diffraction efficiencies of at least 96% that are used for volume holographic optical elements or phase (refractive index modulation) hologram recording by external source of UV or visible radiation described and claimed in the subject application.

10. In my opinion the processes disclosed in the papers and patents referenced in the office action would not be able to achieve recordation of phase holograms by illumination with a uniform UV pattern followed by illumination with an interference pattern of high power visible radiation.

11. In the prior art cited there was no understanding nor any discussions of exposing PTR glass with decreased concentrations of impurities of iron and heavy metal to produce a difference between refractive indices in the unexposed area, the UV exposed areas and the UV and visible light exposed areas for hologram recording by visible light radiation.

Nor is there an understanding or any discussions of decreasing the refractive index in the UV exposed areas after thermal development or of exposing the UV exposed glass to high power visible light to decrease the refractive index in the double exposed area that is higher than the unexposed area but lower than the UV exposed area.

12. In my opinion and based on my experience there was no understanding nor any desirability to try to make PTR glasses having absolute diffraction efficiencies of at least 96% that are used as volume holographic optical elements and for using the two-step illumination process for recording a phase hologram wherein the recorded effect results from a nonlinear process.

Based on my opinion and vast research experience in these areas it would not have been anticipated nor obvious to a person of ordinary skill in the art to invent PTR glass used as phase holograms with the features claimed in claims 1 and 3-25 of the subject invention.

13. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that

those statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Dated: November 17, 2006 Leonid Glebov, PhD

Brian S. Steinberger
Law Offices Of Brian S. Steinberger, P.A.
Registered Patent Attorney
Reg. No. 36,423
101 Brevard Avenue
Cocoa, Florida 32922
(321) 633-5080